APPROVED: /W.C./

03/17/2009

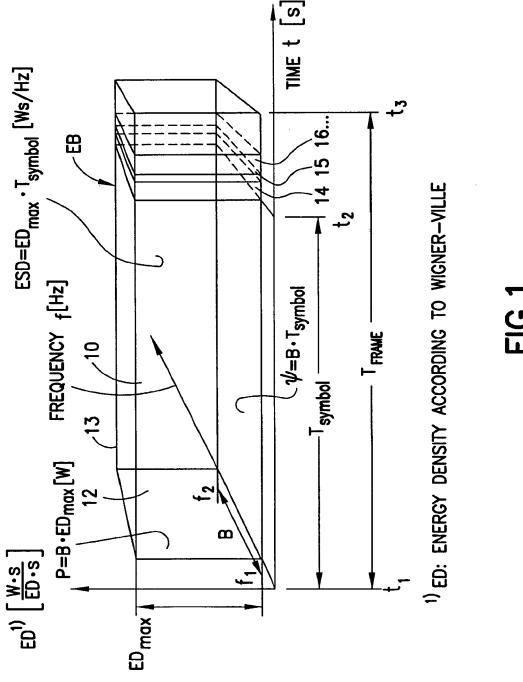
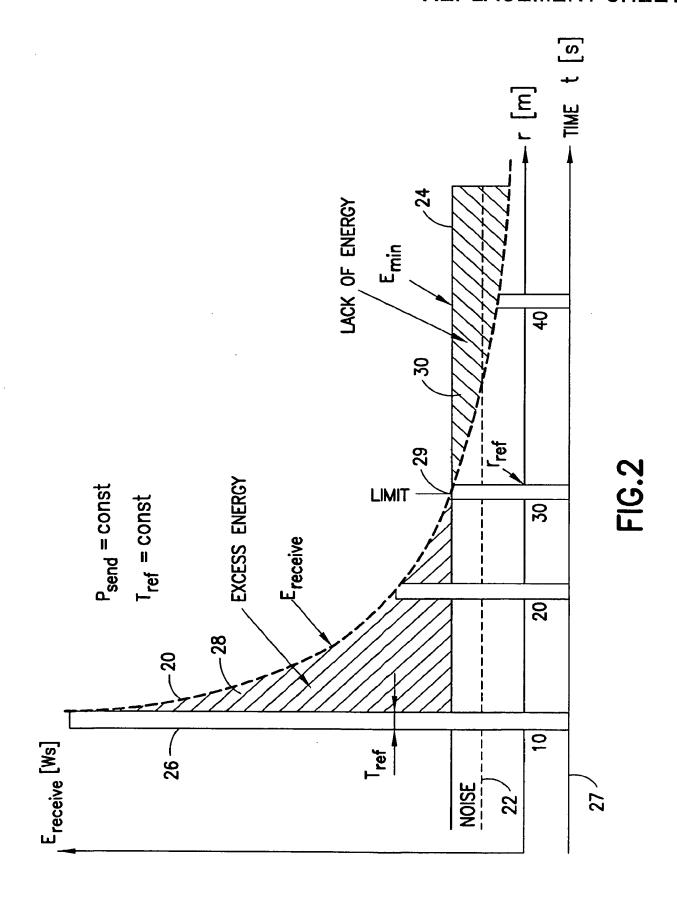
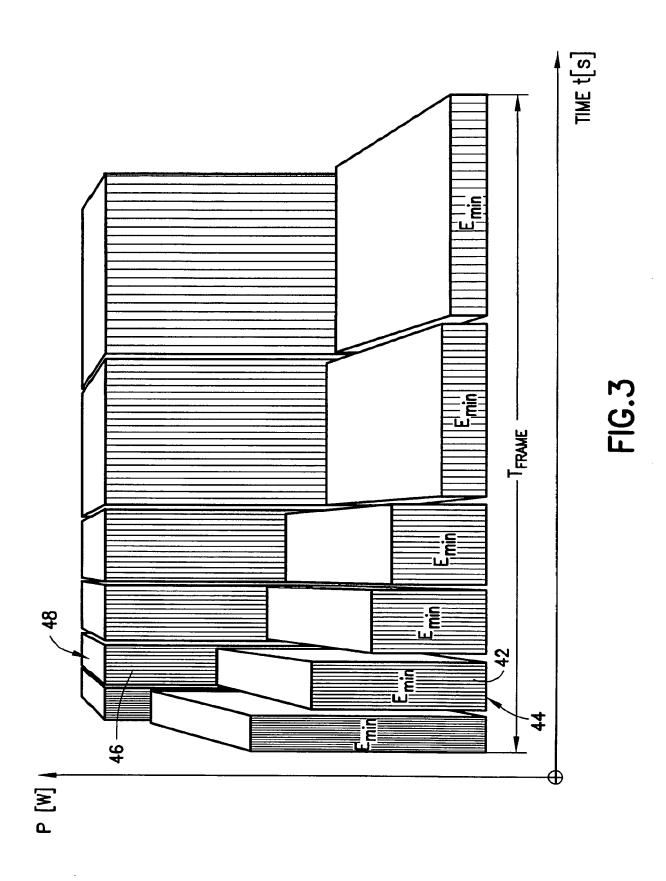
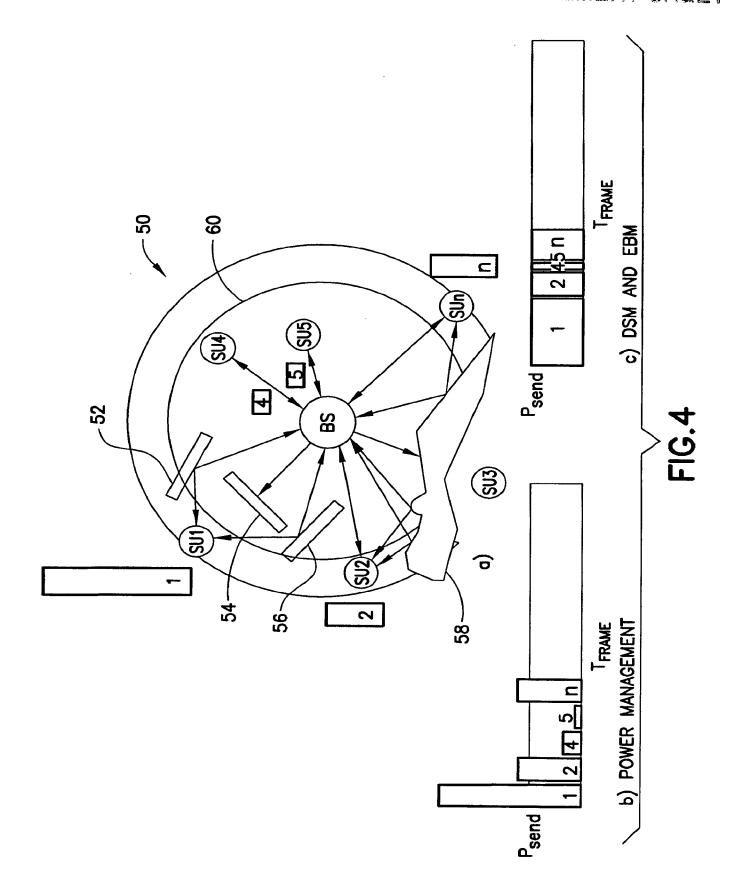


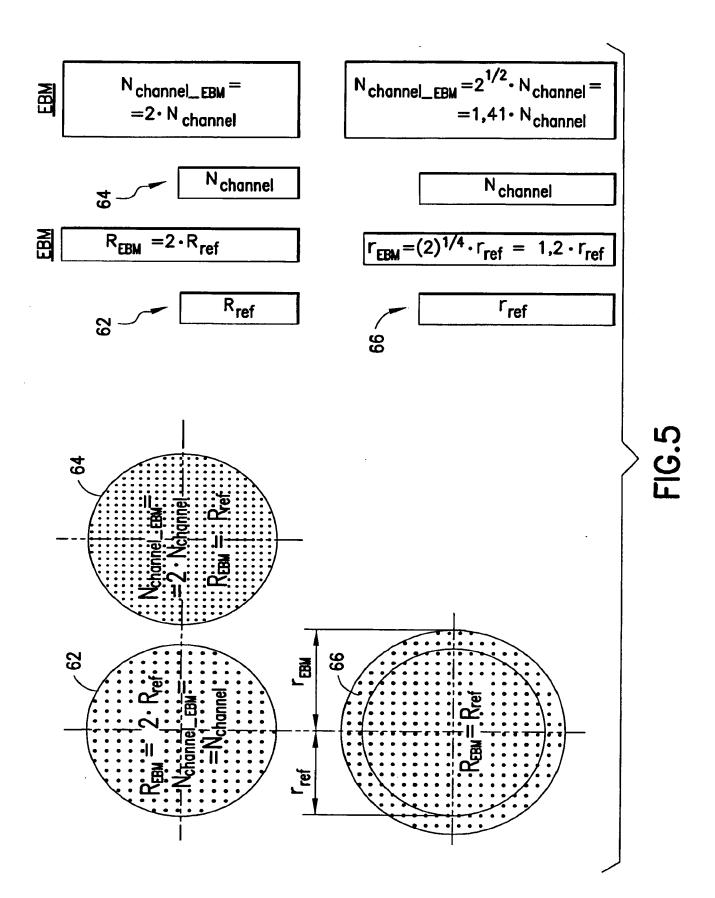
FIG. 1

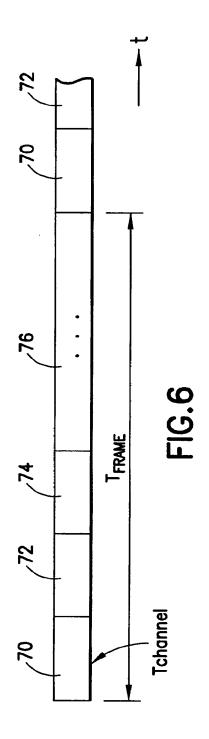
10565285 - GAU: 2617 REPLACEMENT SHEET

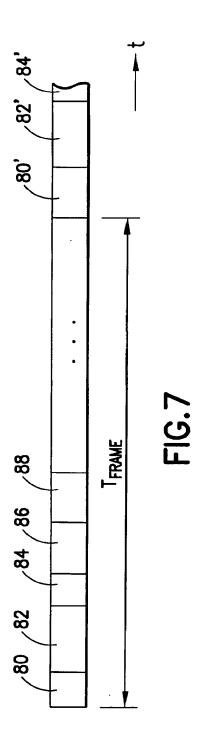


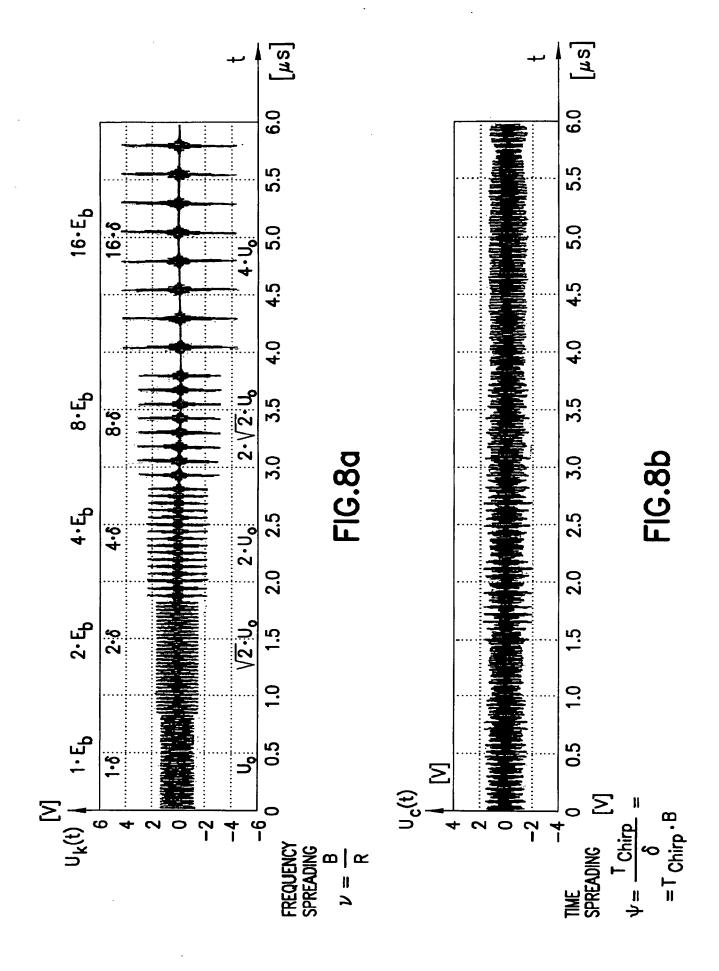


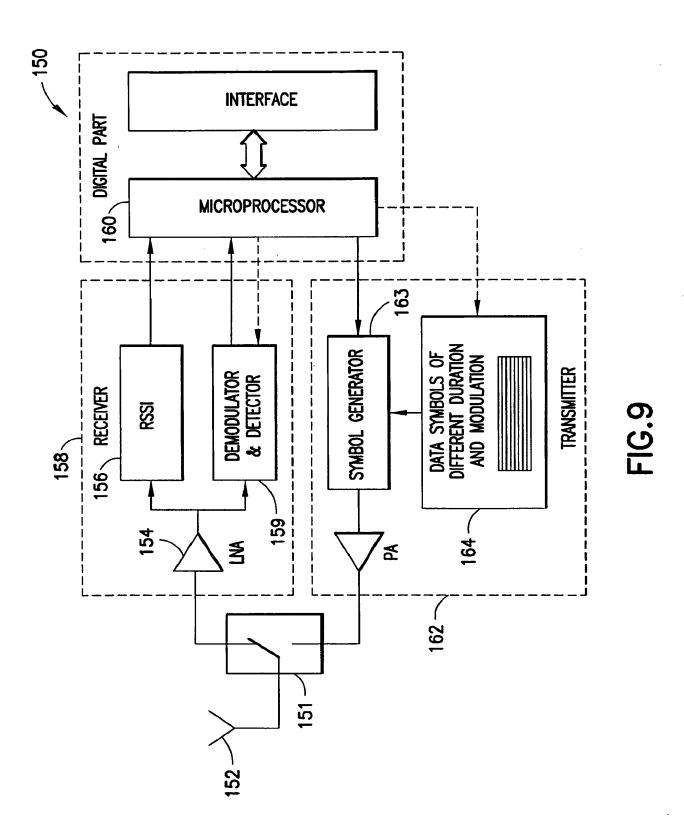


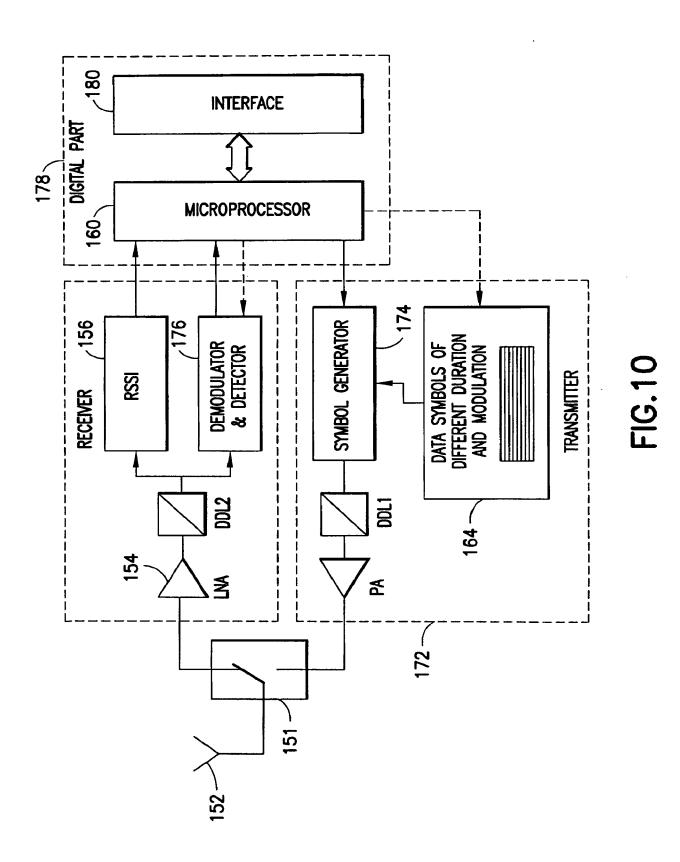


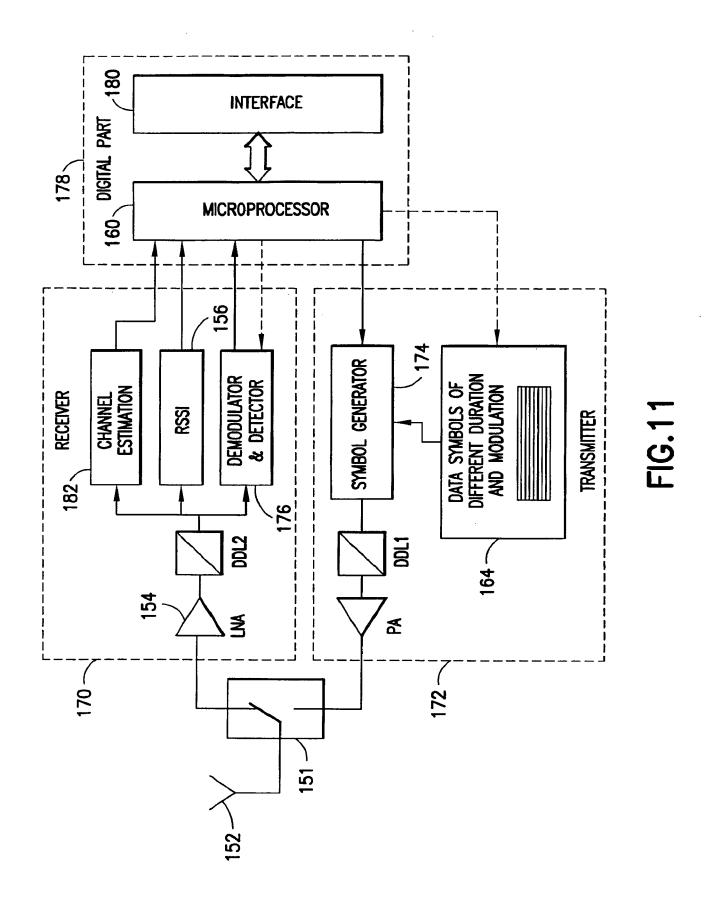












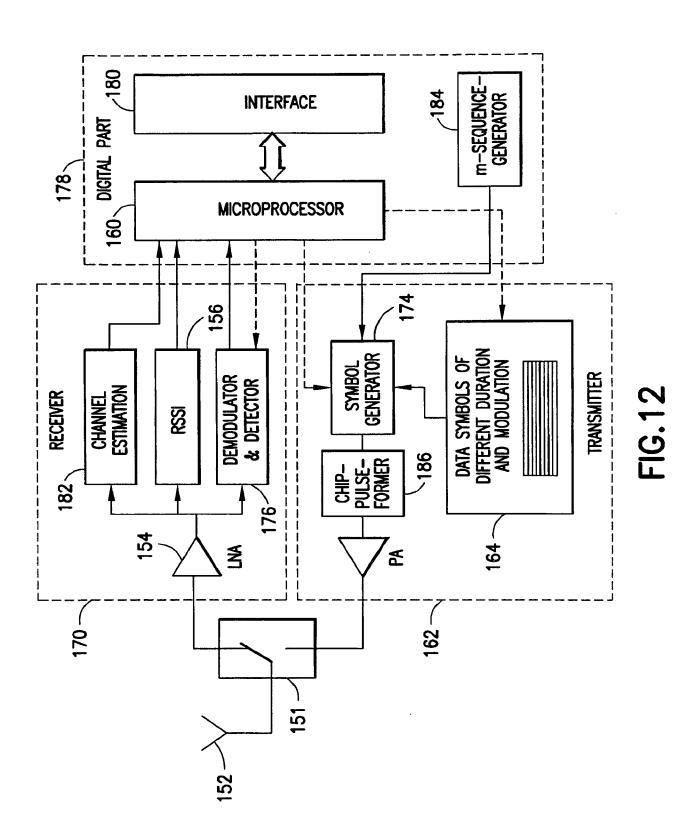
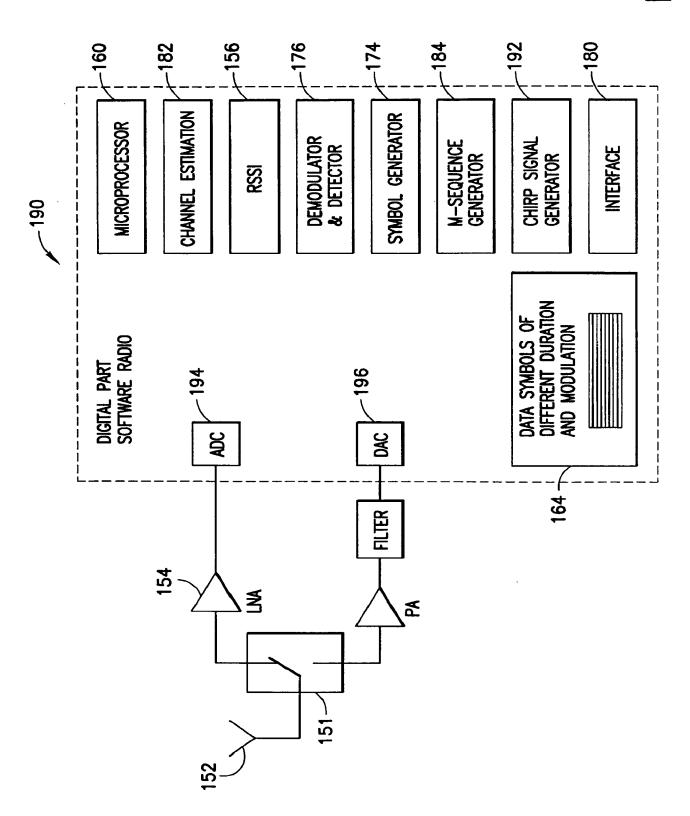


FIG.13



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transmitting a plurality of symbols each having at least one bit from a transmitter to at least one receiver using at least one channel and a predetermined transmission power,

-wherein the symbols are transmitted with a receiver-specific transmission energy which on the part of the receiver results in the reception of the symbol with a reception energy which corresponds to an upper limit value associated with the receiver or a lower value of an error recognition rate in comparison with the upper limit value, and

-wherein to achieve the receiver-specific transmission energy and at the same time a bit rate which is as high as possible in dependence on the currently prevailing transmission conditions between the transmitter and the receiver the symbol duration or the number per symbol of transmitted bits or the symbol duration and the number per symbol of transmitted bits are adapted

204

exclusively the symbol duration is adapted

-208

-206

selecting between three available adaptation options, namely adaptation of the symbol duration, adaptation of the number per symbol of transmitted bits and adaptation both of the symbol duration and also the number per symbol of transmitted bits

-210

in channel-specific fashion on time average the predetermined transmission power and/or the radiated electrical field strength and/or the radiated magnetic field strength and/or the spectral power density in the context of admissible power radiation or a parameter correlated with one or more of said parameters assumes a limit value corresponding to the maximum possible transmission energy per unit of time in the context of admissible radiation

-212

the predetermined transmission power is at a maximum on time average in the context of the technical design of the transmitter

FIG. 14

part 1 of 4

200

the transmission power can be predetermined

216

214

ascertaining a currently prevailing value in respect of the reception energy with a given transmission energy

218

an RSSI measurement (radio signal strength indicator) in respect of the received power is carried out on the part of the receiver and a signal dependent on the measurement result is transmitted to the transmitter

220

ascertaining a currently prevailing value in respect of the error recognition rate

- 222

the error recognition rate is a bit error rate (BER), a block error rate (BLER) or a frame error rate (FER)

- 224

adaptation of the symbol duration is effected in dependence on the currently prevailing value of the error recognition rate at the receiver end or a currently prevailing magnitude at the receiver end of the noise power density

226

the receiver communicates to the transmitter the currently prevailing error recognition rate or the currently prevailing magnitude of the noise power density

228

the transmitter estimates the currently prevailing error recognition rate at the receiver end or the currently prevailing magnitude of the noise power density

- 230

the symbol duration or the number of bits contained in a symbol or both is adjusted down dynamically in dependence on the currently prevailing transmission conditions between transmitter and receiver in an existing connection or an ongoing data traffic without the connection or the data traffic being interrupted

232

the change in the symbol duration takes place continuously in respect of time, alternatively quasi-continuously, alternatively at predetermined time intervals

FIG. 14

part 2 of 4

204

200

234

the symbol duration is adapted in channel-specific fashion, that is to say individually on each channel used

236

the symbol duration is restricted towards short symbol duration values in channel-specific fashion by the bandwidth of the channel

- 238

the symbol duration is determined from a continuous value spectrum

- 240

the symbol duration is determined from a discrete value spectrum, wherein the discrete value spectrum contains the integral multiples of a symbol duration which is the shortest possible in channel-specific relationship

242

the symbol duration T_{symbol} is determined at the transmitter end in accordance with the formula:

$$T_{symbol} = \frac{E_{\min} \cdot \left(r/r_0 \right)^{\alpha}}{P_{send}}$$

wherein E_{min} is the reception energy corresponding to the upper limit value associated with the receiver in respect of the error recognition rate, P_{send} is the maximum transmission power, r is the distance between transmitter and receiver, r_0 is a reference distance and α is a propagation coefficient

244

the selection of the number per symbol of transmitted bits is effected in dependence on the currently prevailing value of the error recognition rate at the receiver end or on a currently prevailing magnitude at the receiver end at the noise power density

246

the number per symbol of transmitted bits is adapted in channel-specific relationship

248

adaptation of the number per symbol of transmitted bits is effected when a symbol duration which is shortest in channel-specific relationship is already used

FIG. 14

part 3 of 4

200 204 250 a type of symbol with the highest possible number of bits is selected for transmission, which at the receiver end does not cause the upper limit value of the error recognition rate to be exceeded 252 the symbols are transmitted divided up to a respective sequence of chips 254 the symbols are transmitted in such a way that the available channel bandwidth is fully used 256 the symbols are transmitted spread in respect of frequency 258 the symbols are transmitted in the form of a chirp signal 260 the symbols are transmitted in the form of a CDMA sequence 262 the symbols are transmitted in the frame of a FDMA method 264 a TDMA method is used on at least one channel 266 the transmitter is a mobile terminal of a user and prior to the transmission of the symbols to a base station receives from the base station information about a frequency band to be used for the transmission 268 a base station operating as a receiver checks incoming signals from a mobile terminal operating as a transmitter with a plurality of modulation modes and uses a modulation mode recognized as correct for reception of the signals from the mobile terminal 270 a base station operating as a receiver receives incoming signals by means of a plurality of receivers, wherein a modulation mode is associated with each receiver and a mobile terminal operating as a transmitter uses one of the modulation modes available at the transmitter end for transmission of symbols to the base station

FIG. 14

part 4 of 4

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- 272

the error recognition rate is ascertained by determining the number of errors within a received data frame

274

the error recognition rate is ascertained by averaging the number of errors in a plurality of data frames

FIG. 14a

- 276

the error recognition rate is ascertained by means of the number of negative receipt signals from the receiver over a predetermined period of time

FIG. 14b

-- 278

the symbols are spread in respect of frequency by being modulated with a noise or pseudo-noise sequence, the noise or pseudo-noise sequence being known to the receiver

FIG. 14c

- 280

the noise or pseudo-noise sequence is dynamically adapted to the selected symbol duration

FIG. 14d

- 282

chirp signals from the transmitter, which are intended for a respective receiver, are superimposed in respect of time

FIG. 14e

- 284

the total of the transmission powers, radiated in a moment in time, of the mutually superimposed chirp signals is equal to the maximum admissible transmission power on the respective channel

FIG. 14f

- 286

division into FDMA channels is effected dynamically in such a way that a lower bandwidth is allocated to receivers with good channel transmission conditions

FIG. 14g

- 300

transmitting a plurality of symbols each with at least one bit from a transmitter to at least one receiver using at least one channel and a predetermined transmission power,

- wherein the symbols are transmitted with a receiver-specific transmission energy which on the part of the receiver leads to the reception of the symbol with a reception energy which corresponds to an upper limit value associated with the receiver or a lower value of an error recognition rate,
- wherein in dependence on the currently prevailing transmission conditions between the transmitter and each individual receiver to achieve the receiverspecific transmission energy and at the same time a bit rate which is as high as possible the symbol duration, or the number per symbol of transmitted bits, or the symbol duration and the number per symbol of transmitted bits are adapted

FIG. 15